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ABSTRACT

The major purpose of this study was to provide insights into some of the reasoning strategies that may be used by students in obtaining meaning from the printed page. The study was designed to collect and analyze the verbal protocols of 11 seventh grade students involved in introspection as they responded to standardized measures of reading comprehension. The protocols were taped and later transcribed for analysis. A tree diagram feature analysis of the verbalizations was used to classify the responses into discrete strategies. The analysis scheme was subjected to a test of applicability. The proportion of agreement (.86) obtained by 10 independent judges was judged to be satisfactory to insure the reliability of the technique. Descriptive and statistical data reported frequency of use and successes, and showed significant strategy effect and a strategy-times-item type interaction for each individual. The study demonstrated the usefulness of introspection as a method for gathering information about the process of reading. It also supported the notion that reasoning strategies can be identified by careful and systematic analysis of students' verbal protocols. (Author/WR)

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A LINGUISTIC FEATURE ANALYSIS OF VERBAL PROTOCOLS ASSOCIATED WITH PUPIL RESPONSES TO STANDARDIZED MEASURES OF READING COMPREHENSION

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Conceptually, the study drew on the positions reflected by researchers in language. Methodologically, it made use of introspection techniques.

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The protocols were taped and later transcribed for analysis. A tree diagram feature analysis of the verbalizations was used to classify the responses into discrete strategies.

The analysis scheme was subjected to a test of applicability. The proportion of agreement (.86) obtained by ten independent judges was judged to be satisfactory to insure the reliability of the technique.

Descriptive and statistical data reported frequency of use, successes, and showed significant strategy effect and a strategy x item type interaction for each individual.

The study demonstrated the usefulness of introspection as a method for gathering information about the process of reading. It also supported the notion that reasoning strategies can be identified by careful and systematic analysis of students' verbal protocols.

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Educators and reading researchers have generally agreed that reading is a complex process. Even though a wealth of research effort has centered on the comprehension of printed material, researchers still call for more complete analysis of the reading process.

Past research has used different methodological approaches to study reading comprehension. Simons (1971) cited and evaluated seven approaches. These include: listing of skills, measurement of pupil performance on standardized tests, factor analysis techniques, correlational studies, readability research, studies of readers introspection reports, construction of psycholinguistic models and psycholinguistic research. He stated, "In spite of the vast literature produced on reading comprehension over the past fifty years...the workings of the mind during reading comprehension remain a great and profound mystery." (p. 340) Buswell (1922) expressed the need for a detailed analysis of the reading process when he stated, "A satisfactory method of studying the growth of reading habits must rest upon the measurement, either directly or indirectly, of some aspect of the actual process of reading." (p. 6)

Bloom (1950) identified inadequacies of past research when he stated:

> What is missing is information on the process by which the problems are solved. The methods of attack, the steps in the thinking process, the kinds of considerations used to make one choice rather than another...are neglected or given little attention." (p. 1)

This study was stimulated by the need to know more about the process of reading. Much research effort has been focused on the product of reading but little seems to be known about the nature of the process. The purpose of the study was to attempt to provide some insights into some of the reasoning strategies that may be used by students in obtaining meaning from the printed page. It represented a preliminary attempt to define operationally these strategies.

Specifically, the study was designed to collect and analyze the protocols of students involved in introspection as they responded to standardized measures of reading comprehension. A secondary purpose was to develop a classification scheme which would produce a reliable, systematic, quantitative coding system for classifying responses to reading passages. The ultimate purpose was to help teachers and researchers to understand the reading process. Providing information about the strategies used while answering questions and developing a system for coding the verbalizations may provide data for future study regarding merits of providing appropriate instructional techniques related to these strategies. The study rested on the assumption that knowing more about the process of comprehension will enable us eventually to deliver appropriate instructional procedures to meet students' needs.

Conceptually the study drew on the positions reflected by researchers in language. Methodologically, it made use of introspective techniques recommended by several previous researchers. Strong (1967), Gray (1958), Bloom and Broder (1950), Squire (1964), Smith (1964).

Specifically, answers to the following questions were sought.

1. Are reasoning strategies constant in frequency across item types?
2. Does there appear to be a preferred reasoning strategy for all item types?
3. Do individual subjects show a preferred reasoning strategy irrespective of item types?
4. Does the preferred reasoning strategy result in more correct choices?
5. Do item types dictate the reasoning strategy that is used?

Design and Analyses

The study capitalized upon Bloom's (1950) suggestion that in order to study and secure evidence on both the processes and the products of thought, research endeavors may need to "...change from large scale testing and mass studies to those which involve small numbers of subjects studied by rather intensive techniques." (p. 4)

Eleven seventh grade students from an urban public school served as the subjects for this study. In order to obtain the needed introspection data it was determined that the students should be reading at or above a grade equivalent of 6.5. A random sample of students was drawn from the population of sixty-one subjects who met this criterion based on the results of Form IM Level D Gates-MacGinite Reading Test.

The instruments used for this study were developed by Schreiner (1968) for an investigation that was designed to identify and isolate specific or unique aspects of the reading comprehension process. Verbal subtests to measure Reasoning, Determining Cause and Effect, Reading for Inference, and Determining the Main Idea were administered. These four tests were used because the correlations computed for them in the Schreiner study indicated evidence of uniqueness.

The test items were administered to the students individually after they had been trained to criterion in using and applying introspection procedures.

The students met individually with the examiner for approximately one half hour each day for five consecutive days. During this time they were first trained to criterion and then they applied the introspection procedures to the forty items found in the instruments used for this study. The protocols were taped for later analysis.

Transcriptions were prepared and used by the investigator in creating the scheme used to classify the responses. Thus the verbalizations determined the categories. Because of the nature of the responses it was determined that a tree diagram feature analysis of the verbalizations would be appropriate.

(Insert Figure 1 about here)

After the examiner had become adept at applying the classification scheme and consistent intra-judge performance had been established, the

classification scheme was subjected to a test of applicability. Ten elementary and secondary public school personnel were trained to use the tree diagram feature analysis and then they applied it to a total of 160 items sampled from the four item types used by the students in this study. The proportion of agreement was .86 and the usefulness of the tree diagram to categorize student responses to reading comprehension passages was assumed to be a reliable technique.

The data were reported descriptively considering frequency of usage, per cent of success, and preferred strategies. In addition the data were treated statistically. Eleven separate analyses of variance were applied to determine the significance for each of the strategy and strategy x item type effects for each individual.

Summary of Findings

This study demonstrated the value of introspection as a method for gathering information about the process of reading.

The inter-judge proportion of agreement (.86) confirmed the usefulness of the classification scheme that was developed. It also supported the notion that reasoning strategies can be identified by careful and systematic analysis of students' verbal protocols.

Other findings of this study were:

1. When summed across item types the frequency of the use of any one strategy varied across item types. Trends in preference seemed to appear and the four most frequently used strategies were:

111	Textual, Discourse Dependent, Key Lexical Item	25.7%
113	Textual, Discourse Dependent, Generalization	23.5%
124	Textual, Choice Dependent, Generalization	11.3%
210	Nontextual, Personal	10.9%

(Insert Table 1 about here)

2. The four most frequently used strategies yielded 80% or greater success in arriving at the correct answer.

(Insert Table 2 about here)

3. Some strategies were not used for some item types.

   114 Textual, Discourse Dependent, Expansion, was never used for Inference types.

   121 Textual, Choice Dependent, Key Lexical Item was never used for the Verbal Reasoning item types.

   122 Textual, Choice Dependent, Spontaneous Lexical Item was never used for Verbal Reasoning item types.

   123 Textual, Choice Dependent, Semantic Fit and

   220 Nontextual, Unrelated Description were never used for Verbal Reasoning, Cause and Effect, and Main Idea item types.

4. Frequency tables revealed that students used specific reasoning strategies more frequently for certain item types. Generalization strategies were used more often with Verbal Reasoning than other item types.

Choice Dependent, Spontaneous Lexical Item and Choice Dependent,

Process of Elimination strategies were used more often with Cause and Effect items than others.

Discourse Dependent, Key Lexical Item strategy was used more often for Inference item types and Main Idea item types.

5. Analysis of Variance revealed a significant strategy effect and a strategy by item type interaction.

6. T here appeared to be a disproportionate frequency of use of strategy 111 with Inference item types and strategy 113 with Verbal Reasoning types.

(Insert Figure 2 about here)

7. Several strategies yielded 100% success. Usually the frequency of use was small.

8. Several strategies yielded 0% success. Usually the frequency of use was small.

General Conclusions

Several general conclusions can be drawn based on the findings of this study.

It appears that the item type may dictate the reasoning strategy that is used by a student in reaching the correct answer.

It also seems that average or above readers in the seventh grade are flexible in their use of reasoning strategies. Although two strategies seemed to be preferred, it was apparent that the students could and did

use other strategies. The strategies that they used most frequently yielded successful responses. In several situations some strategies were used infrequently but yielded the correct response. The strategies that yielded 0% success were also used infrequently. This appears to indicate that students are capable of selecting responses appropriate for their need to arrive at the correct answers.

Students also relied on their own experiences and background when responding to comprehension questions. The success that students experienced when they used a choice dependency strategy supports this conclusion. The fact that a frequently used and successful strategy was nontextual adds another dimension to this conclusion.

It appears that students are willing to try to reach an answer by using a process of elimination strategy even though the end result yields 66% or fewer successes.

Educational Implications

The results of this study have led the investigator to the following conclusions regarding educational implications:

1. Since the procedures used in this study appear to indicate that reasoning strategies can be identified, educators should give more attention to them. More emphasis might be placed on the understanding of reasoning strategies in teacher education classes. Thus, awareness could be developed among teachers that correct answers to reading comprehension questions can be reached by applying different reasoning strategies. The

teachers who served as judges for determining reliability became skilled at using the scheme after about three hours of training. They expressed an interest in knowing more about reasoning strategies and the information that can be obtained by analyzing verbal protocols. Several suggested that they would like to apply the analysis scheme and use the procedure in their instructional settings, especially with students who appear to have difficulty comprehending. This interest seems to indicate the practicality of the analysis described in this study.

2. Teachers need to become increasingly aware of the importance of the lexicon as it relates to reading comprehension. Teacher's Editions provided with reading series often encourage the teacher to emphasize aspects of comprehension such as reading to draw inferences, understanding the author's purpose, and sensing the tone or mood. The results of this study indicate that a frequently used reasoning strategy which also yielded a high number of successes is that of focusing on key lexical items. It would appear that this would be a worthwhile reasoning strategy for the teacher to develop instructionally. It is an approach that can easily be developed in the classroom and lends itself well to direct instruction. The teacher can apparently consider time well spent when focusing on vocabulary study and word meaning.

3. The broad category of generalization was a successful and frequently used strategy. It would appear that by focusing on verbal and written exercises relating to generalization the teacher can help the student develop a useful strategy that will aid in reading comprehension. Specifically, this would include practice in classifying words, categorizing words or objects, sorting by attributes, and indicating like and unlike qualities.

4. The importance of experiential background and the individual's personal repertoire of information was pointed out by the frequency and success of Strategy 210. Educators should be encouraged to provide vicarious and real experiences for students so they can transfer this knowledge to success in reading comprehension.

5. Teaching materials (commercial and teacher made) might be developed to provide experiences in applying the four most frequent strategies identified by this study.

6. Since the Textual, Choice Dependent, Process of Elimination strategy was used quite frequently but with little success, teachers should discourage the application of this strategy and emphasize those that yielded more success.

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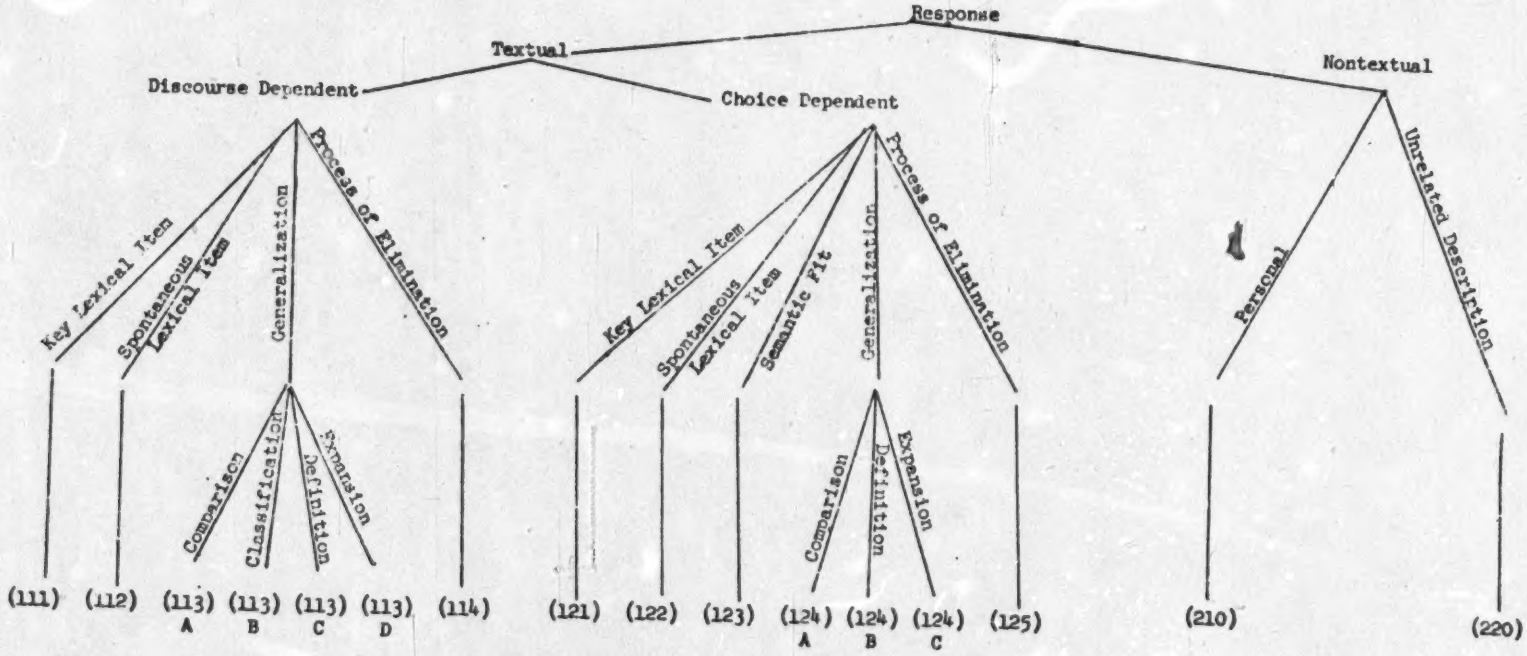

Figure 1. The Tree Diagram Used in Classifying the Data Obtained from the Protocols

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Table 1
Frequency of Occurrence of Reasoning Strategies
Across Item Types

		Verbal Reasoning		Cause and Effect		Main Idea		Inferences		Total		
		N	%	N	%	N	%	N	%	N	%	
	111 KLI	16	14.5	3	2.7	33*	30.0	61*	55.4	113	25.7	
	112 SLI	3	2.1	2	1.8	5	4.5	4	3.6	14	3.1	
Generalization	113A Comp.	39*	35.5	4	3.6	20*	18.1	3	3.6	66	15.0	
Generalization	113B Class.	20*	18.1	0	-	3	2.7	0	-	23	5.2	104
Generalization	113C Def.	11*	10.0	0	-	3	2.7	0	-	14	3.1	23.5%
Generalization	113D Exp.	0*	-	0	-	0	-	1	.09	1	0.2	
	114 Exp.	6	5.4	1	.09	1	.09	0	-	8	1.8	
	121 KLI	0	-	12	10.9	9	8.1	4	3.6	25	5.6	
	122 SLI	0	-	29*	26.3	2	1.8	1	.09	32	7.2	
	123 S.F.	0	-	0	-	0	-	3	2.7	3	0.6	
Generalization	124A Comp.	0	-	3	2.7	10	9.0	0	-	13	3.0	
Generalization	124B Def.	5	4.5	17	15.4	6	5.4	8	7.2	36	8.1	50
Generalization	124C Exp.	0	-	0	-	0	-	0	-	1	0.2	11.3%
	125 P. of E.	4	3.6	21*	19.0	5	4.5	12	10.9	42	9.5	
	210 Pers.	6	5.4	18	16.3	13	11.8	11	10.0	48	10.9	
	220 U.D.	0	-	0	-	0	-	1	.09	1	0.2	
	Total	110		110		110		110		440		

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Table 2
Frequency of Use of Strategies and the Per Cent of Success for Item Types and Composite

	Verbal Reasoning		Cause and Effect		Main Idea		Inferences		Total	
111	15/16	93.8%	3/3	100. %	24/33	72.7%	53/61	88.3%	95/113	84. %
112	3/3	100. %	2/2	100. %	5/5	100. %	4/4	100. %	14/14	100. %
113A	35/39	89.7%	0/4	0	15/20	75. %	2/3	66.6%	52/66	79. %
113B	20/20	100. %	-		3/3	100. %	-		23/23	100. %
113C	6/11	54.5%	-		2/3	66. %	-		8/14	57.1%
113D	-		-		-		1/1	100. %	1/1	100. %
113		81.4%				70. %		100. %		84. %
114	5/6	83.3%	1/1	100. %	0/1	0	-		6/8	75. %
121	-		11/12	91.6%	5/9	55.5%	4/4	100. %	20/25	80. %
122	-		21/29	72.4%	2/2	100. %	0/1	0	23/32	71.8%
123	-		-		-		3/3	100. %	3/3	100. %
124A	-		1/3	33.3%	9/10	90. %	-		10/13	76.9%
124B	-		14/17	82.3%	3/6	50. %	7/8	87.5%	29/36	80.5%
124C	-		-		-		1/1	100. %	1/1	100. %
124				57.8%		70. %		93.7%		85.8%
125	2/4	50. %	14/21	66.6%	3/5	60. %	5/12	41.6%	24/42	57.1%
210	5/6	83.3%	17/18	94.4%	9/13	69.2%	10/11	90.9%	41/48	85.4%
220	-		-		-		1/1	100. %	1/1	100. %

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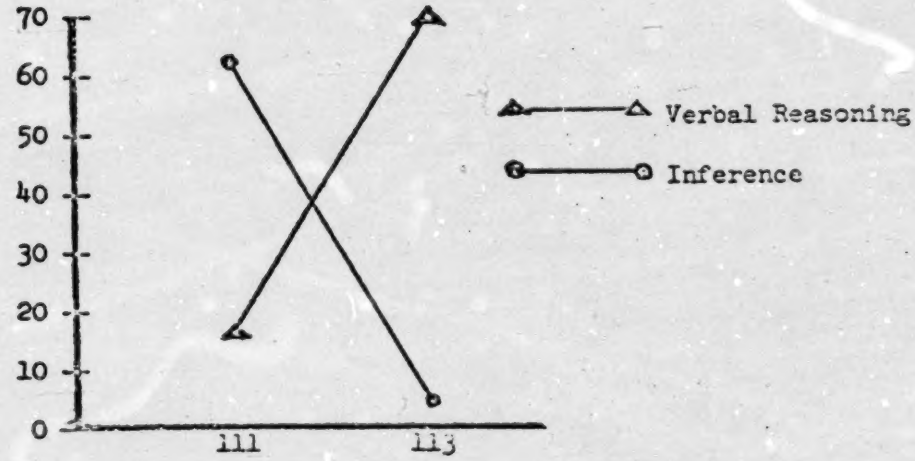

Figure 2 Use of Two Strategies Summed Across All Item Types

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This research was conducted by M. Victoria Jacobson in partial fulfillment for the Degree of Doctor of Philosophy, University of Minnesota, Minneapolis, Minnesota.